

# SCIENCE

## *And Technology Program*



FY 1999 - FY 2000

Roller-compacted concrete (RCC) is commonly used to cover embankment dam slopes to provide spillway capacity for existing and newly constructed dams. The RCC is often placed in lifts producing a stepped surface that will produce some level of energy dissipation, aeration, and a change in the total dissolved gas levels.

Few guidelines exist for the hydraulic design of stepped spillways related to energy dissipation and air entrainment. Velocities at the toe of the spillway are used to size required stilling basins. Stepped spillways should reduce toe velocities and allow for a reduction in the size of the required stilling basin. This can be a substantial economic savings in the construction of a dam. However, optimistically minimizing basin lengths or chute wall heights can lead to unacceptable erosion; therefore, it is imperative to have well defined energy dissipation and air entrainment guidelines.

The project objective is to obtain data on a prototype structure which will eliminate scale effects associated with previous modeling and thereby produce accurate air entrainment and velocity data that will define energy dissipation on a 2:1 slope with RCC steps. The prototype test facility is located at Colorado State University in Fort Collins, Colorado.

An additional benefit of stepped spillways is the ability to produce highly aerated flow over a small drop. Water quality issues may be solved by use of stepped spillways if the total dissolved gas levels produced by specific discharges over the stepped surface is known. Total dissolved gas will also be measured in the prototype structure.

This project began in the third quarter of FY 1999 with the modification to the prototype test facility and execution of a cooperative agreement with Colorado State University. The facility was ready for testing at the end of FY1999.

Colorado State University